

Joint Technology Exchange Group



U.S. AIR FORCE

**Advanced Technology
Demonstrations (ATDs)**

24 Oct 2003

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AFMC/ENB**



AFRL ATDs

Rapidly delivering war-winning capability

AFRL Commissioned ATD's	Champion	Co-Champion
Advanced NDE for Aging Structures	OC-ALC	WR-ALC
Aging Wiring Systems Diagnostics	OO-ALC	WR-ALC
Engine Rotor Life Extension	OC-ALC	NA
Corrosion Effects on Structural Integrity	WR-ALC	OO-ALC
Advanced Aircraft Corrosion Protection	WR-ALC	OC-ALC
Bonded Repair Capability Enhancements	WR-ALC	OC-ALC
Bonded Repair of Thick/Complex Structures	WR-ALC	OO-ALC
Non-critical Laser Additive Manufacturing	WR-ALC	NA
No New Candidates This Round		



Enabling Capability

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Assess Total System Readiness





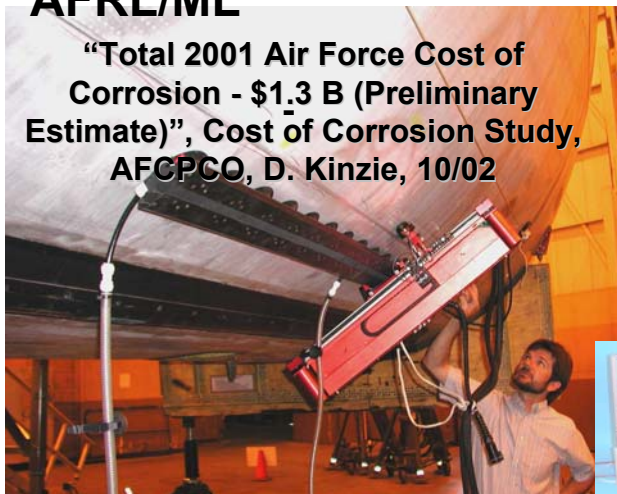
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Advanced NDE for Aging Structures

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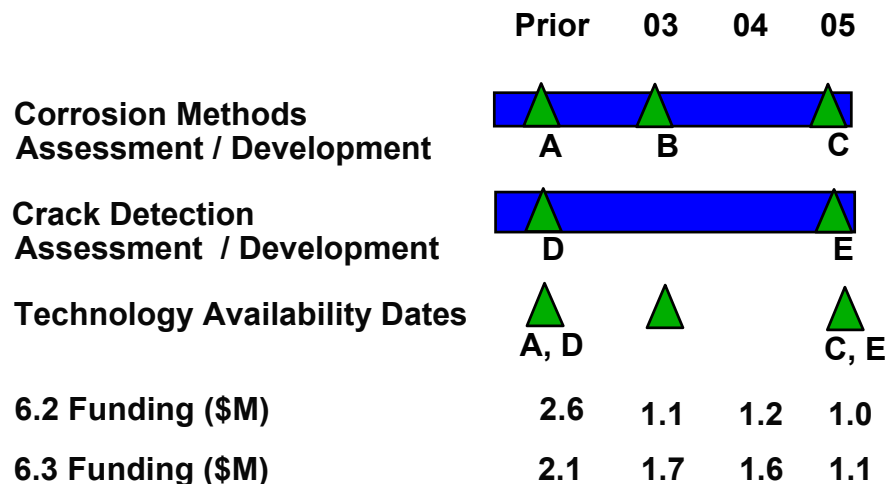
"Total 2001 Air Force Cost of Corrosion - \$1.3 B (Preliminary Estimate)", Cost of Corrosion Study, AFCPCO, D. Kinzie, 10/02



MAUS Inspection of KC-135 (Stringer 25)



Technology Investment Schedule (FY) As of 27 Aug 2003



Description	Benefits to the War Fighter
<ul style="list-style-type: none"> Periodic delivery of NDI methods to detect and quantify corrosion NDI methods targeted at multi-layer crack detection and quantification 	<ul style="list-style-type: none"> Increased safety through detection and elimination of detrimental multi - site damage Improved readiness through reduction of time in depot - increased aircraft availability Reduced maintenance costs Eliminate unnecessary teardown
Technology	
<ul style="list-style-type: none"> NDE methods with rapid, large area scanning capability. Probability of Detection methodology. Computer simulation models for NDE methodologies 	

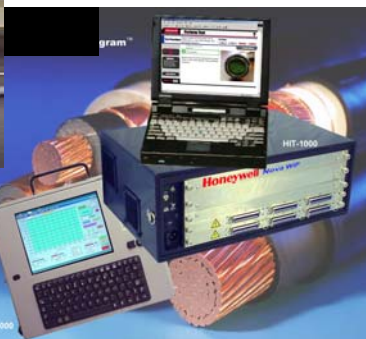
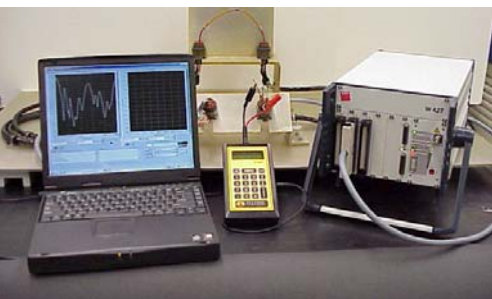


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Aging Wiring System Diagnostics

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Technology Investment Schedule (FY) As of 8 Oct 03

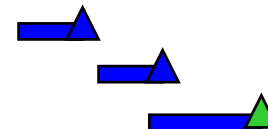
Technology Availability

Establish Architecture

Integrate Diagnostic System

Testing & Validation

Prior FY03 FY04



CONTRACT FUNDING (\$K)

AFRL/ML 6.3	125		
DUS&T	500		
FAA	125		
Industry	500	300	88

Description

- Develop, validate, & transition a portable wiring system tester to the user community (both military & commercial).

Technology

- Ability to detect opens & shorts, as well as provide fault location.
- Diagnostic system that:
 - Guides users in fault detection
 - Interprets and archives system data
 - Alerts user to type of problem.

Benefits to the War Fighter

The aging of a wiring system can result in loss of critical functions in aerospace equipment or loss of critical information regarding equipment operation. Fielding AFRL's wiring system diagnostics will:

- Reduce troubleshooting & repair time by 50%
- Reduce unneeded Line Replacement Units (LRUs) replacement by 65%
- Provide the foundation for managing wiring as a system



Engine Rotor Life Extension (ERLE)

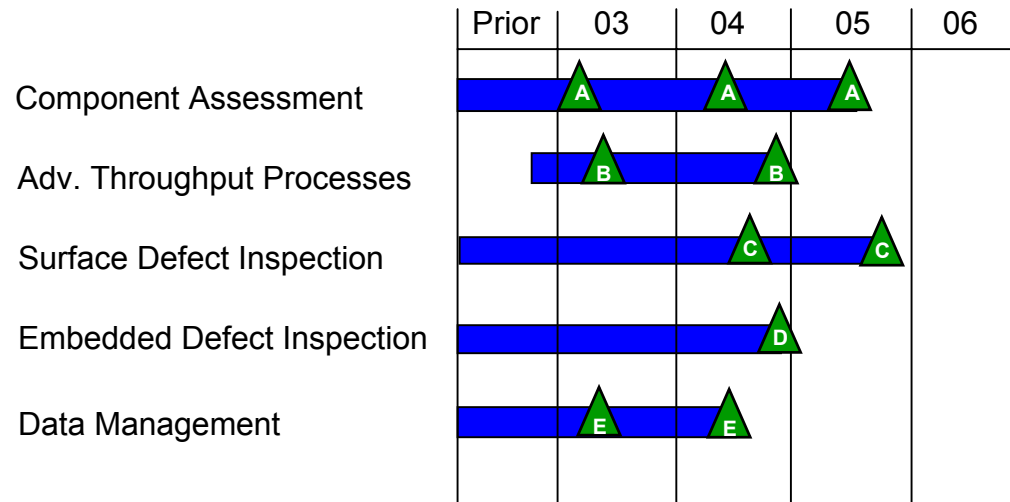
Spiral I

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Cost Avoidance through Life Extension

Technology Investment Schedule (FY) As of 15 Oct 03



Funding (\$M)	6.3:	8.5	1.6	
ManTech (\$M)	7.8:	3.7	7.9	2.4
PRAM (\$M)	7.8:	6.2		

Condemned Disks

Description

- In partnership with OC-ALC, mature, validate, and implement advanced nondestructive evaluation tools and repair technologies that increase safety and extend useful life of critical turbine engine components

Technologies

- Non-destructive evaluation, data fusion, and repair technologies

Benefits to the War Fighter

- Increased safety through improved inspections and more accurate life prediction
- Improved readiness through reduced depot overhaul time and cost
- Reduced component replacement cost
 - Cost Avoidance over \$300M



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Determine Strategies to Increase System Availability





Corrosion Effects on Structural Integrity

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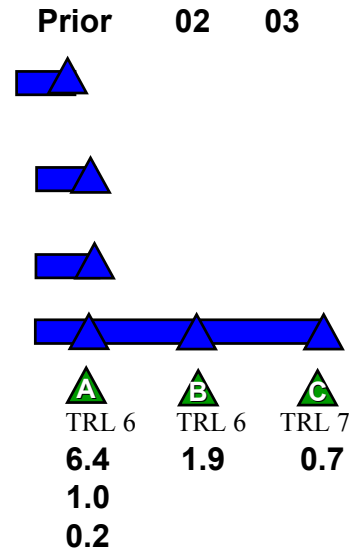
AFRL/VA

Technology Investment Schedule (FY) As of 1 Jul 03



Stress Corrosion Cracking
Guidelines
Identify Problems & Assess
Corrosion Models
Model Development & Element
Testing
Component Demonstration and
Model Verification
Technology Availability

Funding (\$M) 6.2/6.3
NAVY
Nunn



Product Description

- A** • Stress Corrosion Cracking Guidelines - Delivered
- B** • Structural Integrity (Corrosion/Fatigue) Model-Framework Delivered
- C** • Structural Integrity Tool Set, Modified Aircraft Tracking System, Handbooks & Inspection Capability Guidelines

Technologies

- Techniques to assess Corrosion impact on Structural Integrity
 - Improve capability of Aircraft Structural Integrity Program

Benefits to the War Fighter

- Increase Operational Readiness
- Maintain Safety
- Reduce Operations and Support Cost
 - Reduced Maintenance Actions
 - Extend Structural Life
 - Reduce Cost of Maintenance of C-130, C-141, KC-135, C-5, F-15, F-16, A-10 ...



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A photograph of a U.S. Air Force F-35 fighter jet on a tarmac. A ground crew member in camouflage and a headset is signaling the aircraft. The jet has a pilot visible in the cockpit and the name "SSGT MICHAEL FAASS" on the side. The text "Use Improved Processes to Minimize Downtime and Cost" is overlaid in yellow.

Use Improved Processes
to Minimize Downtime
and Cost

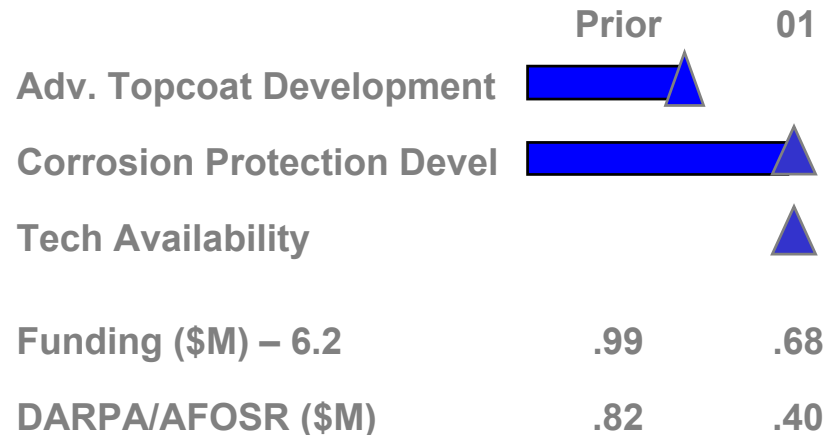


Advanced Aircraft Corrosion Protection

AFRL/ML



Technology Investment Schedule (FY) **As of 24 Jan 02**



Description	Benefits to the Warfighter
<ul style="list-style-type: none"> • Product: Corrosion protection systems with long life topcoat and environmentally safe, non-chrome corrosion protection (sol-gel) demo'd in a depot environment 	<ul style="list-style-type: none"> • Supports ACC MNS/ORD “Advanced Aircraft Coating Capability” (MNS CAF/AMC/AETC/ AFSOC/AFMC 712-97) • Elimination of corrosion protection related hazardous wastes and materials • Reduced depot flow time and related maintenance costs
Technology	
<ul style="list-style-type: none"> • Advanced performance topcoat with service life of 5-8 yr (PDM to PDM) • Non-chrome sol-gel based corrosion resistant surface treatments 	










Bonded Repair Capability Enhancements



AFRL/VA/ML



Technology Investment Schedule (FY) As of 1 Jul 02

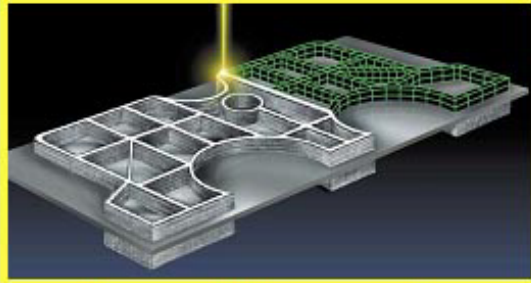
	Prior	02	03
Expanded Materials Database	 A		
Advanced Metal Surface Prep	 B		
Updated Bonded Repair Guidelines	 C		
Validated D&A Models/Software		 D	
Technology Availability	 A, B, C		 D
Funding (\$M) 6.2/6.3	7.0	2.7	
6.3B (CEV) Funding	0.3		
SERDP Funding	1.4		

Description	Benefits to the War Fighter
<ul style="list-style-type: none"> Design/Analysis (D&A) Methods and Materials/Processes (M&P) for Bonded Repairs Validation of Models and Processes Documented Guidelines/Procedures and Repair Materials Data 	<ul style="list-style-type: none"> Decreased Maintenance and Support Costs and Increased Aircraft Availability <ul style="list-style-type: none"> Reduced Design and Analysis Time Reduced Repair Installation Time Improved Repair Reliability/Effectiveness Reduced Use of Hazardous Materials
Technologies	
<ul style="list-style-type: none"> PC- based Software Tools for Design & Analysis Sol- gel Processes for Metal Surface Preparation 	

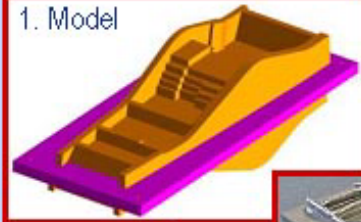


Non-critical Ti Components via Laser Additive Manufacturing (LAM) Spiral

AFRL/ML



1. Model



3. Machine



2. Deposit



Technology Investment Schedule (FY)

As of 26 Sep 03

Prior

03

04

Chem. & Heat-Treat Selection



Producibility Demo



Cost-Savings Eval.



Technology Availability



6.2 Funding (\$M)

0.4

6.3 Funding (\$M)

0.6

Industry Funding (\$M)

0.6

Description

- Application of Novel Manufacturing Method to Reduce Lead Time and / or Acquisition Cost for F-15 Pylon Ribs and C-17 Pylon Panels
- Strategy Development to Spiral Transition to Additional Non-critical Components on Multiple Systems

Technology

- Freeform Fabrication of ~100% Dense Ti Preforms Via Rastering of Laser Beam and Powder Source Across Ti Substrate
- Applicable to Certain Non-critical Parts Based on Performance Requirements, Part Geometry, and Cost/Benefit Analysis

Benefits to the War Fighter

- Improved Operational Readiness:
 - Reduced Manufacturing Lead Time for New or Replacement Components
 - Higher Material Yield Than Forging & Machining
 - Potential Acquisition Cost Savings on per-Component Basis

